Summary

Construction of the National Ignition Facility (NIF) has made striking progress since groundbreaking two years ago. The NIF Project, which began as a line item project in fiscal year 1996, has proceeded rapidly through the detailed engineering design phase. About two-thirds of the required $1.2 billion has been appropriated and several hundred companies have received orders or contracts. At present NIF is within budget and on schedule for completion at the end of 2003.

More than two years after beginning construction, conventional facilities progress is on schedule, and optics and manufacturing industries are ramping up to manufacture NIF components.

Laser bay 2 construction in June 1999.

Target area construction in June 1999.

Target chamber pedestal assembly construction in April 1999.

NIF Optics Assembly Building construction in late May 1999.

Conventional Facility Construction

Soon after construction was authorized in March 1997, bulldozers and backhoes began the 55-foot-deep target area excavation. During the winter of 1997–1998, there were three notable findings:

- In September, 112 PCB-leaking capacitors were unearthed.
- In October/November, El Nino pummeled the site with record-setting rainfall.
- In December, 16,000-year-old mammoth bones were uncovered.

In each case the NIF team responded to the situation while minimizing the impact to the overall construction schedule. For the capacitor and the mammoth bone findings, the affected area was isolated and work proceeded elsewhere. Tasks were reordered. Federal, state, and local authorities were involved.

The Department of Energy and LLNL worked with regulatory agencies to remove capacitors from the NIF site.

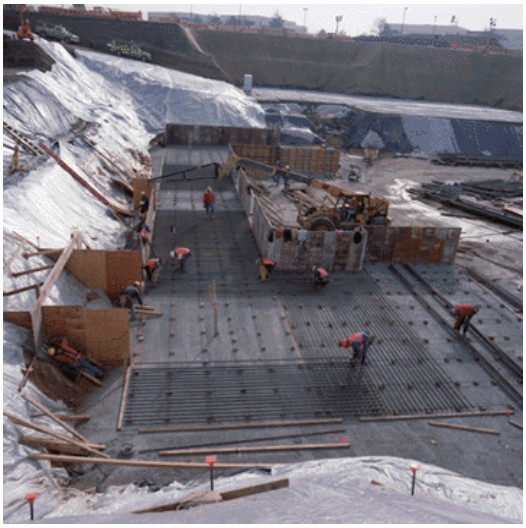
Within about 10 days in each case the findings were removed from the NIF construction site and the Project had approval to proceed.

Excavation of 16,000-year-old mammoth bones.

.

On November 26, heavy rains dumped more than 200,000 gallons of water on the site in a few hours, causing substantial damage. Experts were consulted and wet-weather construction techniques adopted.

Throughout winter, crews worked two shifts a day to make up for the lost time. By Spring of 1998 work was within a few weeks of being on schedule.



Extreme deluges threatened schedule-impacting delays in winter 1997-1998.

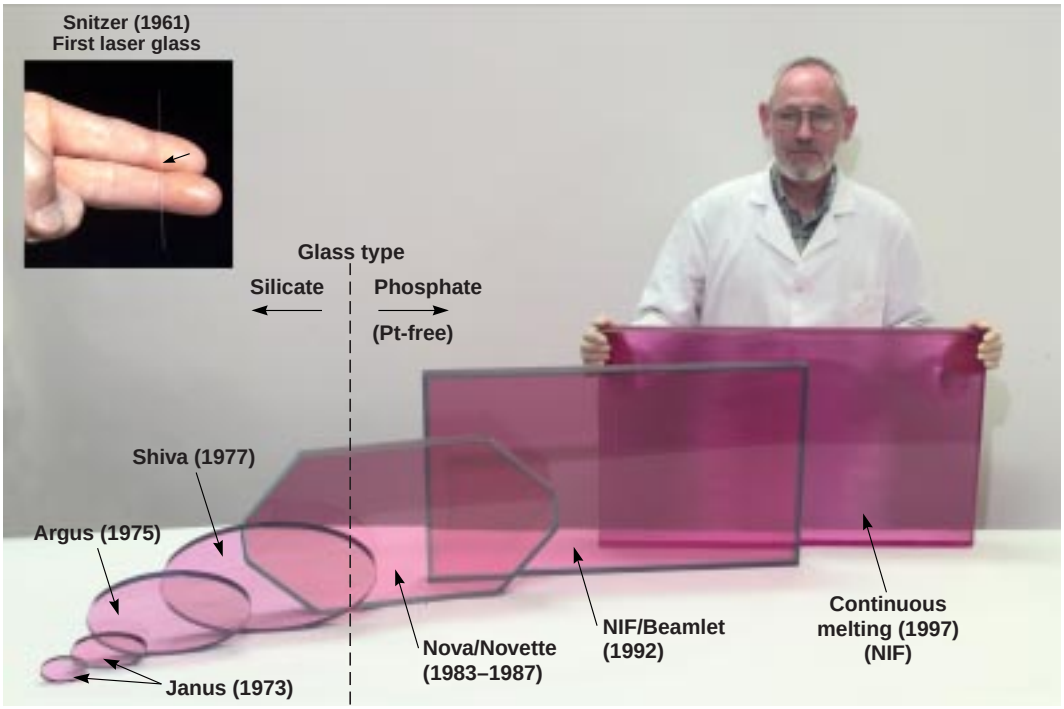
Schedule lost to El Nino deluges was recovered by spring of 1998.

Optical Components

NIF's 192-beam laser contains more than 7000 large-size (greater than one foot in diameter) optical components and more than 20,000 small-scale optical components. These range from the more than 3000 laser slabs to the hundreds of very large crystals of pure potassium dihydrogen phosphate (KDP). The large crystals will be cut into plates that will polarity switch laser beams into and out of laser amplifier cavities, as well as change the color of the laser beams at the target chamber.

The NIF components will require higher optical quality, a ten-times-greater production rate, and a substantially lower unit cost than their Nova laser counterparts. These demands present a major challenge that project and industry teams are addressing with new processes that will revolutionize the U.S. precision optics industry. For example, NIF requires continuous pour processes—like those used to manufacture automobile windshields—for producing greater amounts of higher quality glass at reduced per-unit cost. Laser glass will now come out in continuous strips that will be cut to the needed length. New manufacturing equipment has been installed in many companies and prototype production runs are currently underway to assure that manufactured NIF parts meet quality, cost, and schedule goals.

Prototype mechanical assemblies have been made and tested for all systems, including amplifier modules, optical switch assemblies, power conditioning modules, and preamplifier modules. The very large mechanical structures that support these assemblies are being manufactured throughout the country and are arriving at LLNL for installation.

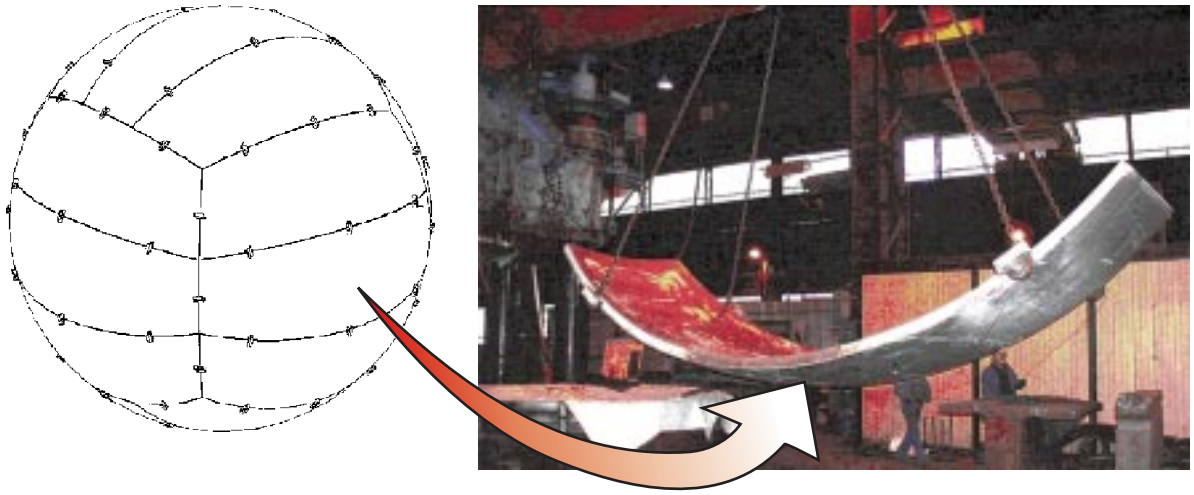


Laser glass technology has improved dramatically to meet the needs of NIF

.

Target Chamber

The 30-foot-diameter aluminum target chamber—in which NIF target ignition will occur—is a triumph of engineering and teamwork. The chamber is made from 18 spherical segments, each like the segments of a volleyball. Eighteen 7.5-ton, 4-inch-thick flat plates were cast in West Virginia, shaped in France, precision edge machined in Pennsylvania to permit the sections to fit together and align the weld joints, then shipped to LLNL for assembly. The pieces were welded together inside a temporary building erected near the NIF construction site.



NIF's target chamber assembly comprises 18 sections totaling 264,000 pounds.

After assembly, 192 holes of various sizes were precisely located and bored for laser beams, diagnostic instruments, targets, and other equipment that will be put into the chamber. Flanges were then mounted to allow connection to final optics assemblies and diagnostics equipment.

The chamber will be installed on its pedestal within the NIF target area soon after NIF Day ceremonies on June 11, 1999.

NIF target chamber in chamber assembly building.

Completion of NIF

The NIF construction project is scheduled for completion by the end of fiscal year 2003. Some beam lines will be in use well before that date, however. The current plan calls for making a few beamlines available many months before the end of project construction so that integrated beamlines can be tested and the experimental communities can begin using NIF's advanced capabilities. The goal for fusion ignition and energy gain on NIF is toward the latter half of the first decade of the 21st Century.

The NIF target chamber ready for installation onto the target chamber pedestal.

Work performed under the auspices of the U.S. Department of Energy for Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

UCRL-TB-134449